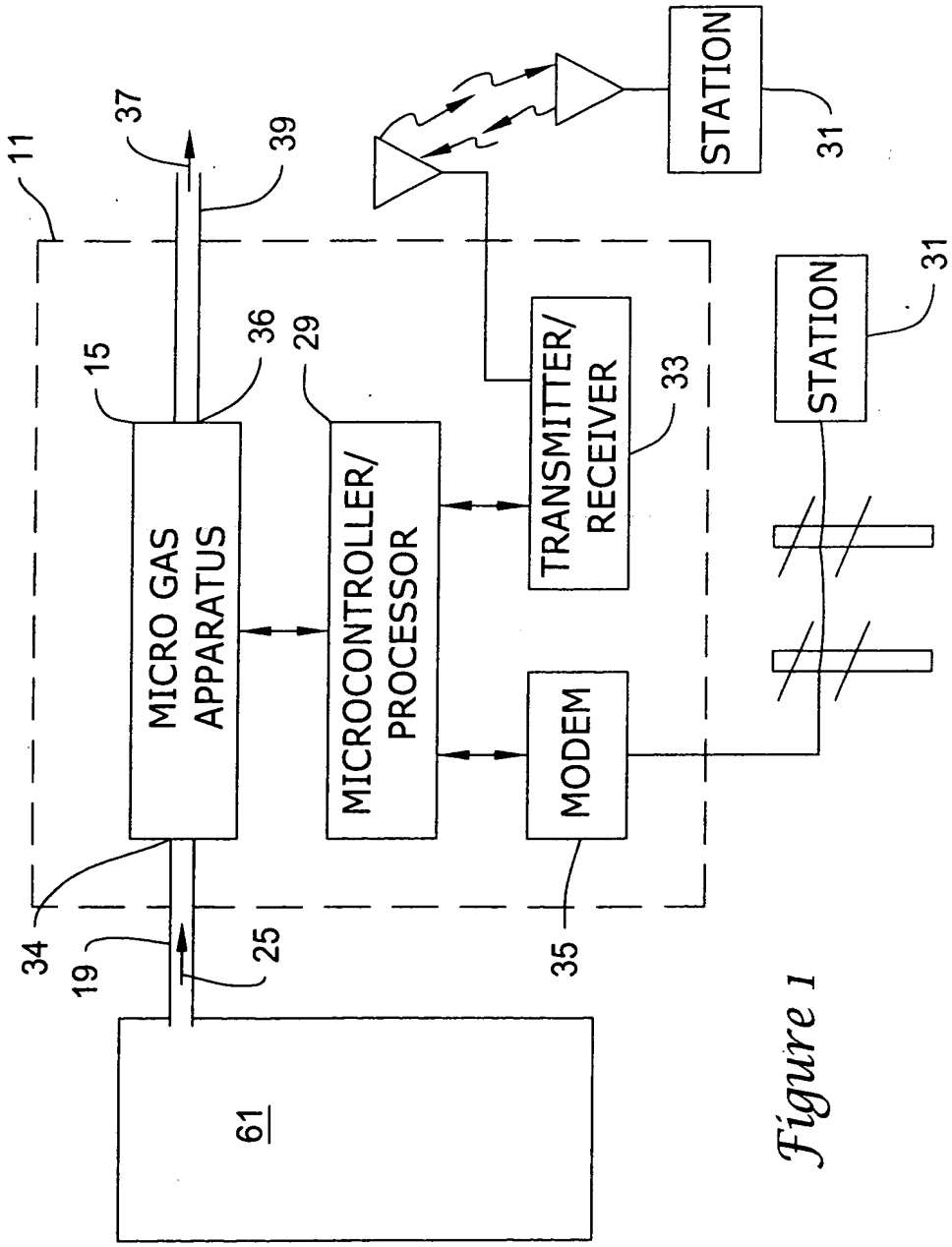

Figure 1

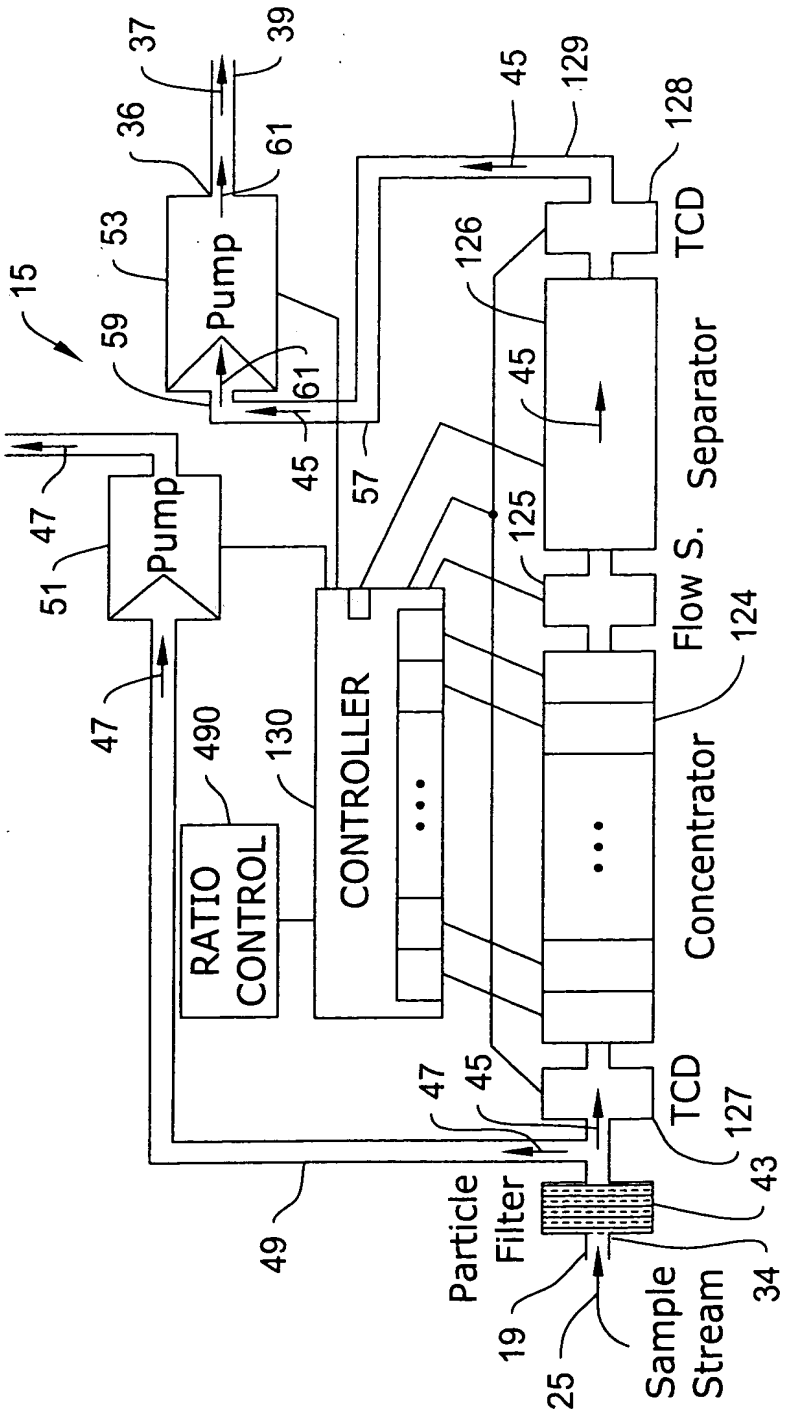
15
Pump
Pump
RATIO CONTROL
CONTROLLER
Flow S. Separator
Concentrator
TCD
TCD
Particle Filter
Sample Stream
37
39
36
61
53
59
61
45
57
47
51
47
490
130
49
45
129
128
126
45
125
124
47
45
127
43
34
19
25

Figure 2

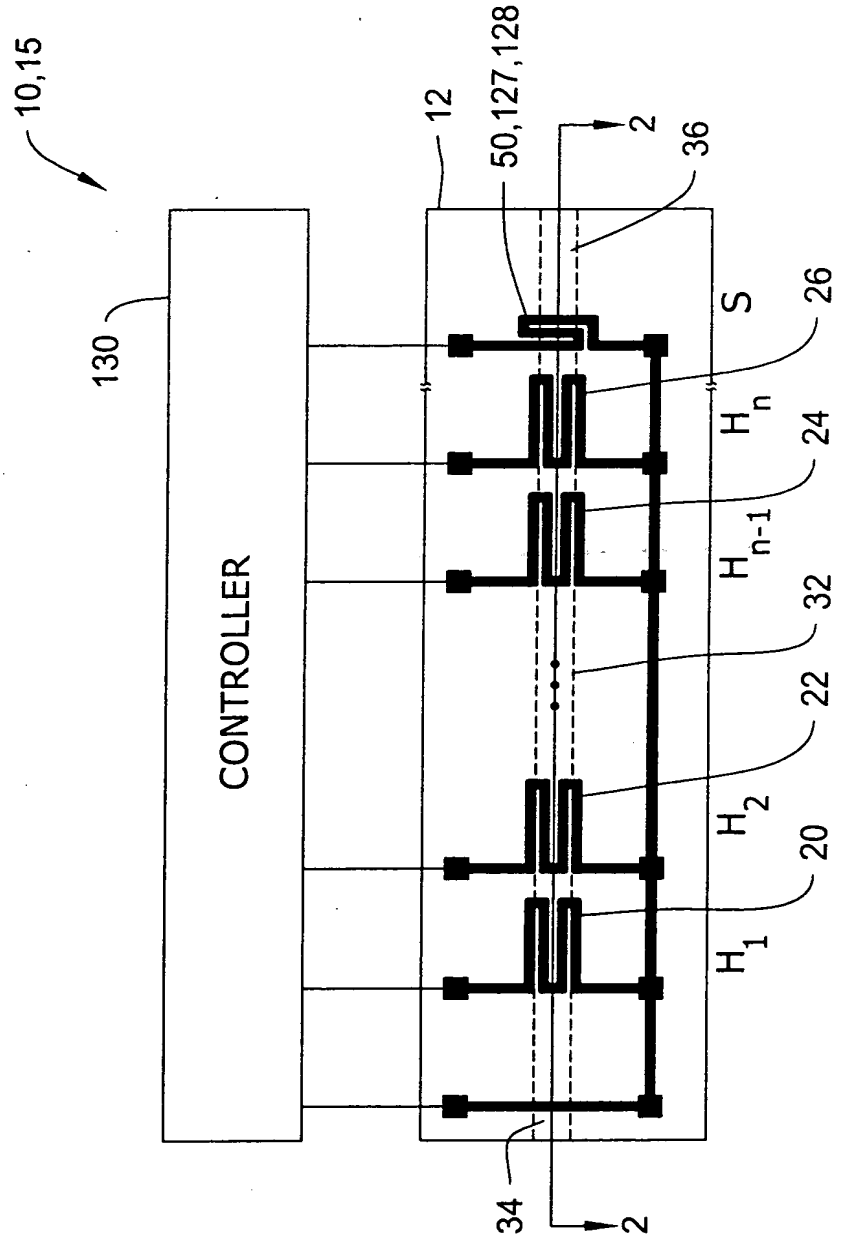
10,15
12
50,127,128
2
36
130
CONTROLLER
S
26
H_n
24
H_{n-1}
32
22
H_2
20
H_1
34
2

Figure 3

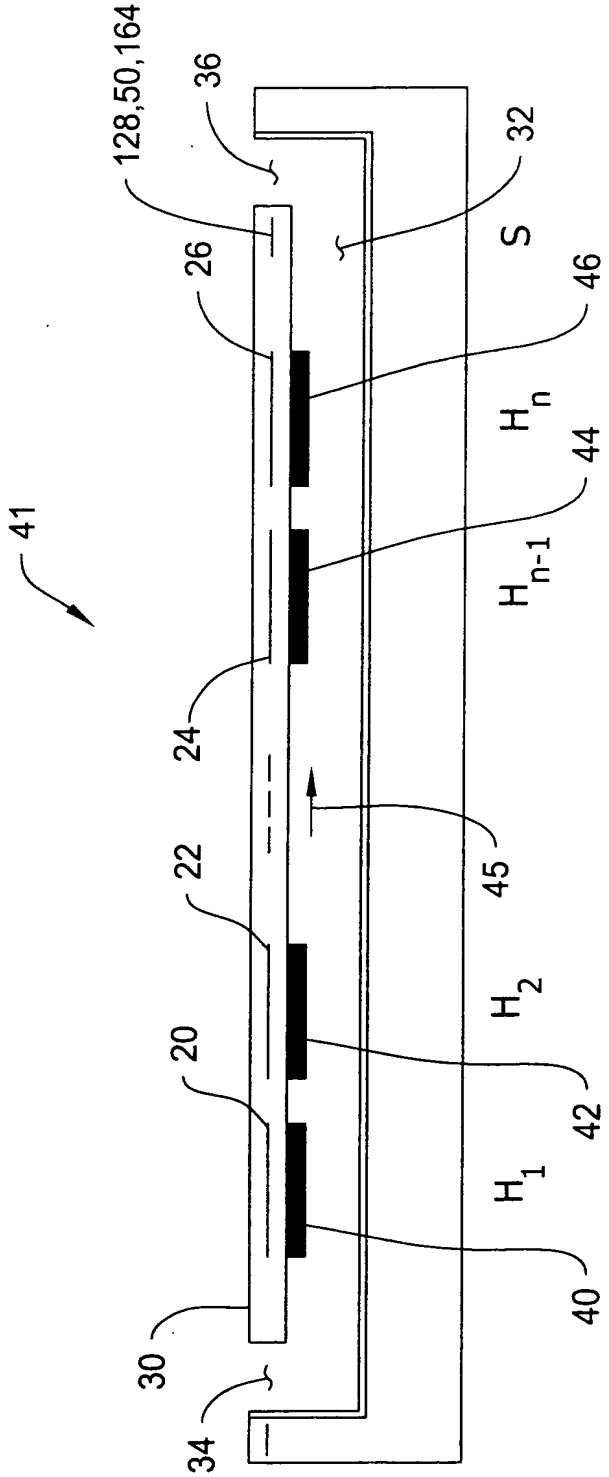

Figure 4

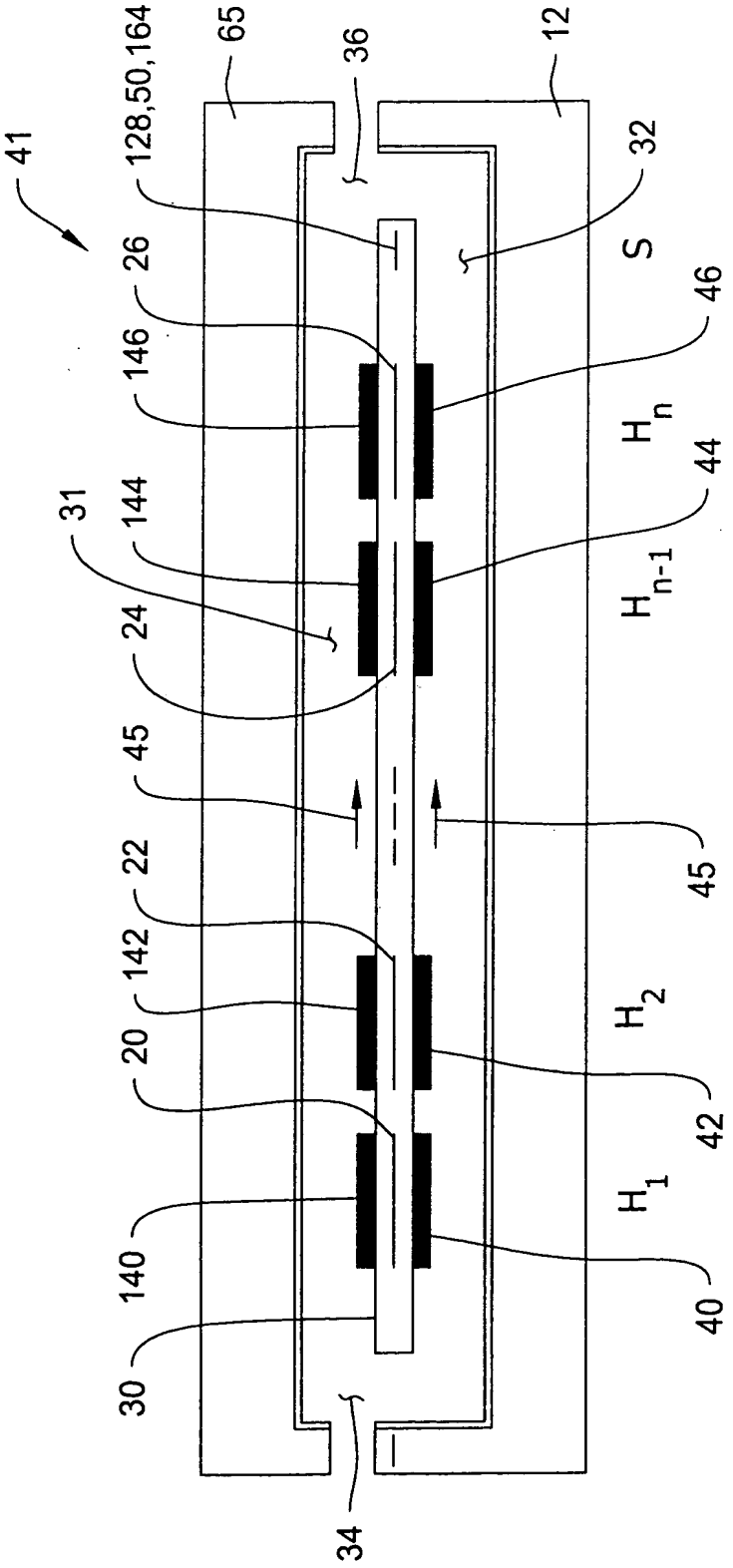
41
128,50,164
65
36
12
32
S
26
146
46
H_n
144
44
H_{n-1}
31
24
45
45
22
142
H_2
20
42
140
H_1
40
30
34

Figure 5

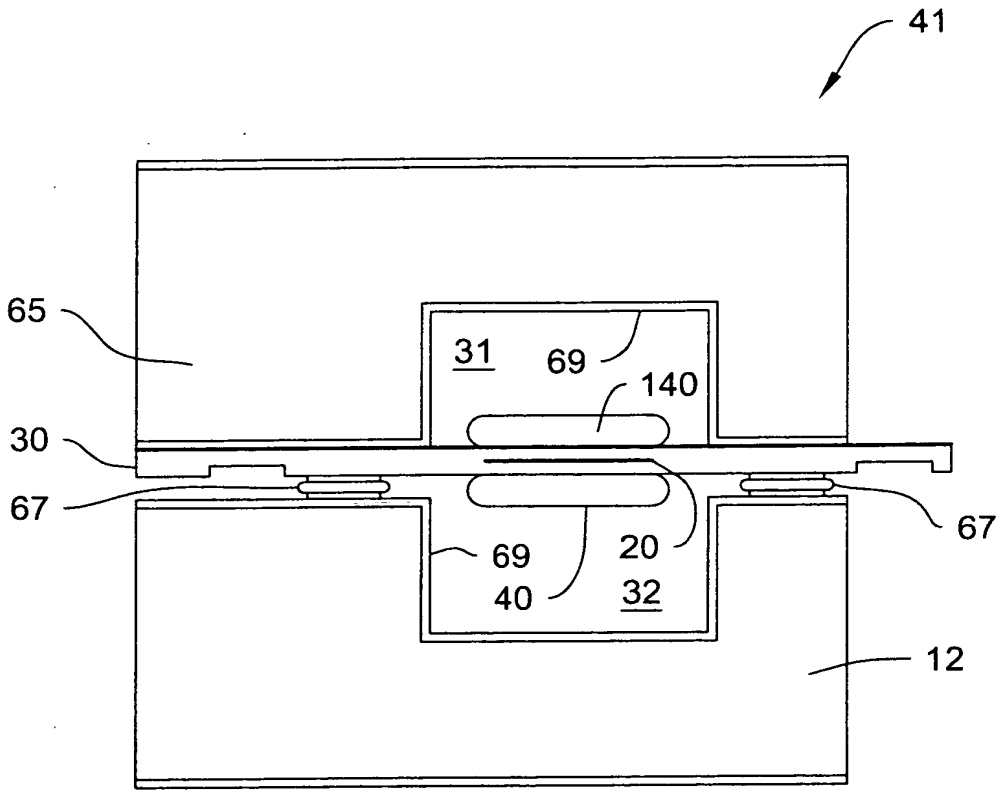

Figure 6A

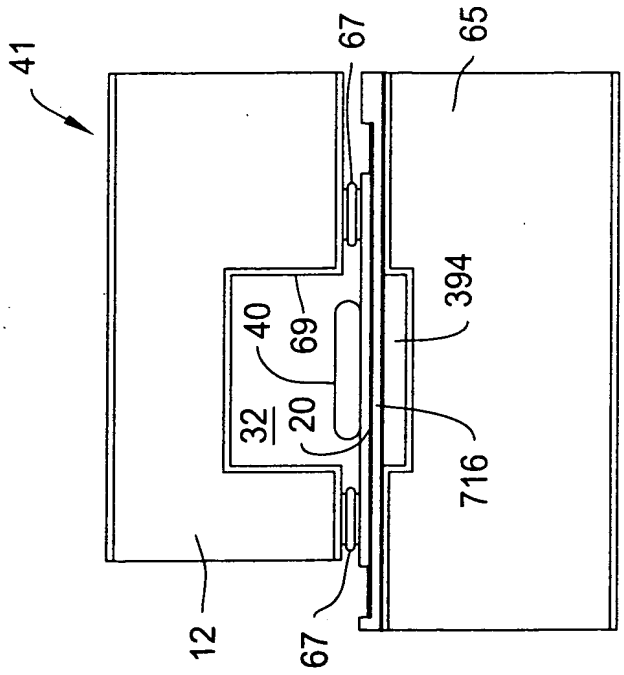

Figure 6C

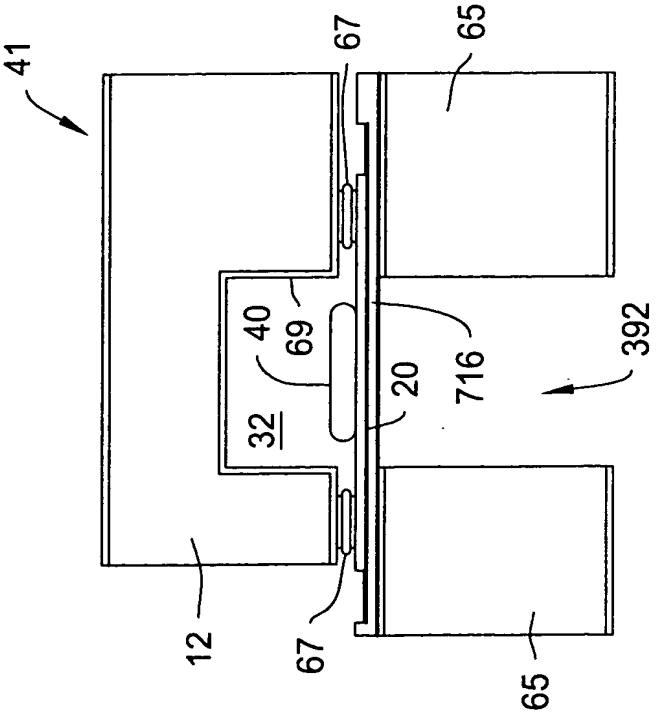

Figure 6B

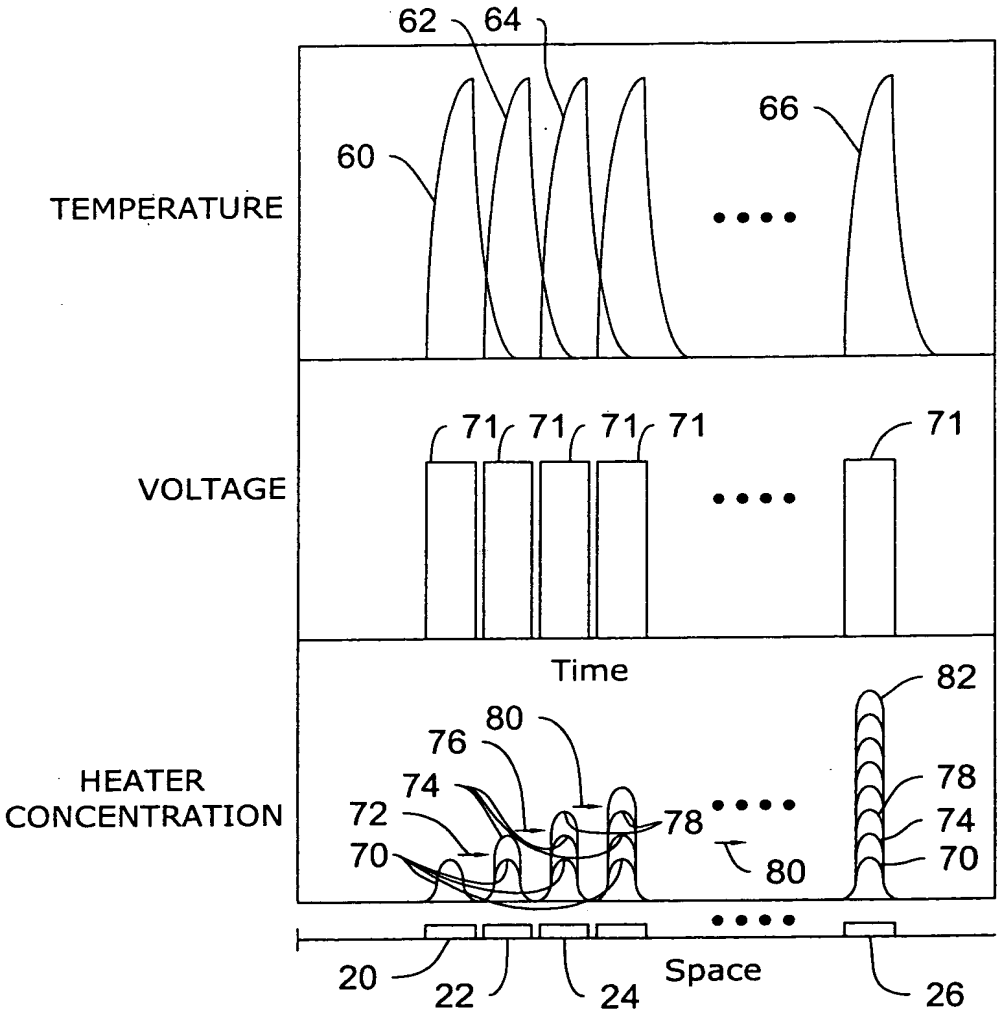
62
64
66
60
TEMPERATURE
71
71
71
71
71
VOLTAGE
Time
82
80
76
74
72
70
78
HEATER
CONCENTRATION
78
74
70
80
20
22
24
Space
26

Figure 7

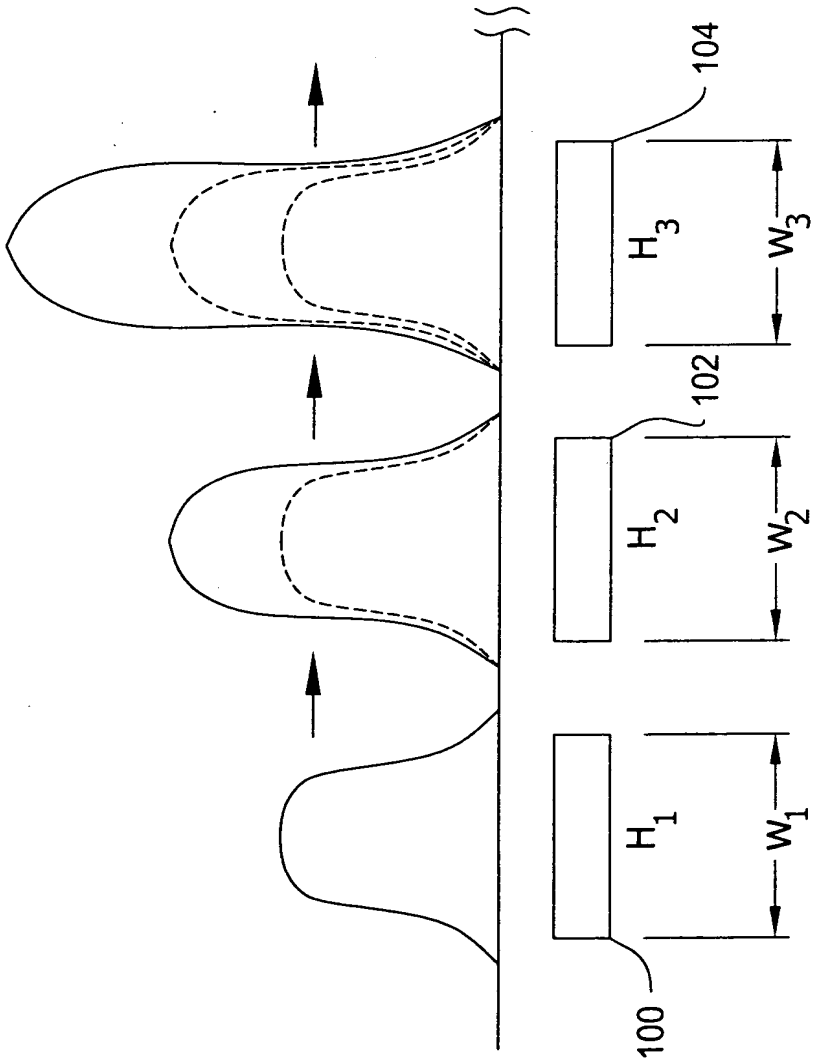

Figure 8

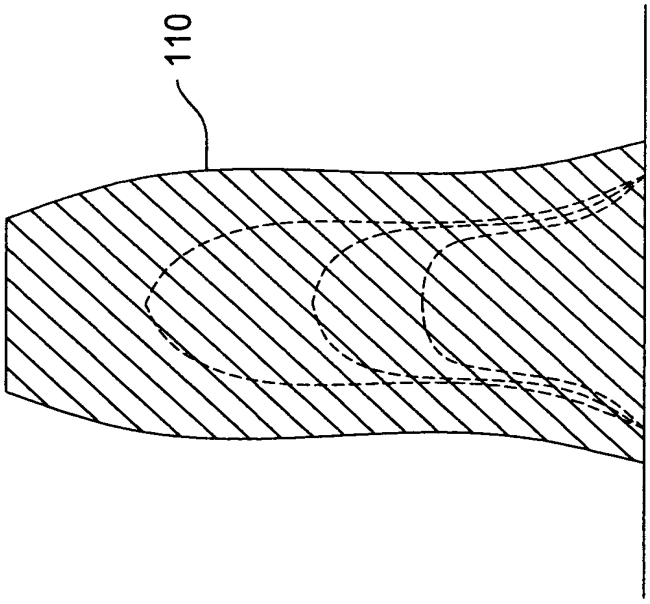

Figure 9

Comparison of Detection Limits in pg/s (MDL) and Selectivities x 10^3(SEL)

element	wavelength, nm	Present work		Ref C (without background correction)		Ref C (with background correction)		Ref A (echelle)		Ref B (with background correction)	
		MDL	SEL	MDL	SEL	MDL	SEL	MDL	SEL	MDL	SEL
N	174.2	7.0	6								
S	180.7	1.7	150								
Hg	184.9	0.1	3000								
C	193.1	0.5								53	
F	177.5	1.5	25								
C	247.9	2.6		2.7							
Si	251.6	7.6	90	9.3	1.6			58	3.9		
P	253.6			3.3	11			4.2	26		
Hg	253.7	0.1	5000	0.6	77			2.0	91		
Br	470.4			33	0.27	67	1.0	20	1.4	38	0.53
Br	478.6	76	19	34	0.60						
Cl	479.5	39	25	43	0.61	86	1.5			32	1.0
Cl	481.0							32	2.4		
H	486.1	2.2		16							
S	545.4	7.2	26	33	0.08	52	4.6	126	0.25	234	0.07
D	656.1	2.5	0.6[C]	7.4	0.19						
H	656.3	3.0		7.5						37	
F	685.6	40	30	20	0.57	180	11.4	17	3.5	11	0.82
O	777.2	76	25								

Reference A uses peak width at base instead of peak width at half height to determine MDL, and the numbers have been adjusted accordingly for comparison. Reference B uses 1σ instead of peak to peak (6σ) to measure noise for MDL, and their numbers have been adjusted accordingly for comparison. [C]Versus hydrogen.

Figure 10

Application Serial No. 10/748,029
Filed: December 30, 2003
Reply to Notice of Incomplete Reply
REPLACEMENT SHEET

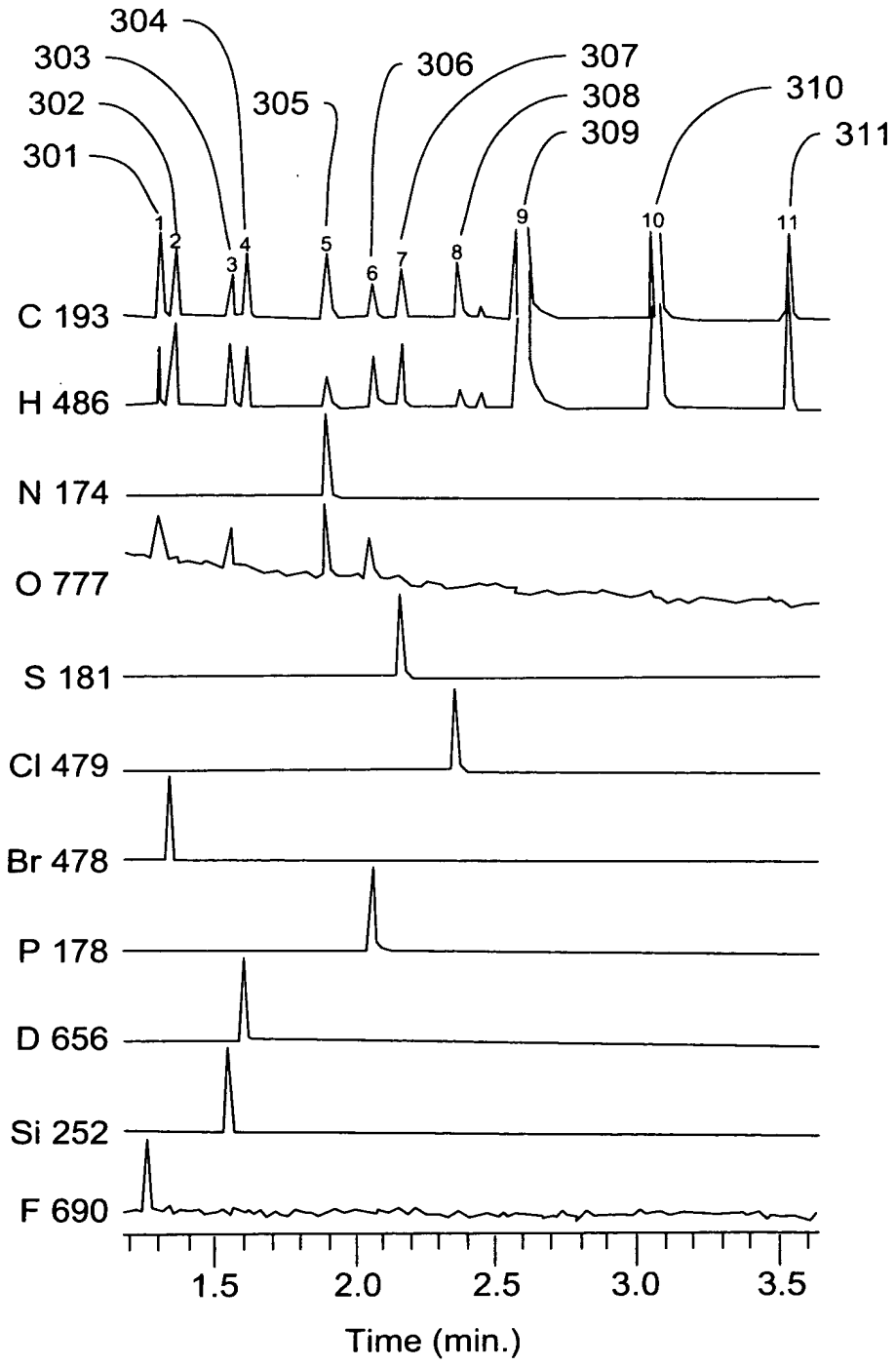
304
303
302
301
305
306
307
308
309
310
311
1
2
3
4
5
6
7
8
9
10
11
C 193
H 486
N 174
O 777
S 181
Cl 479
Br 478
P 178
D 656
Si 252
F 690
1.5
2.0
2.5
3.0
3.5
Time (min.)

Figure 11

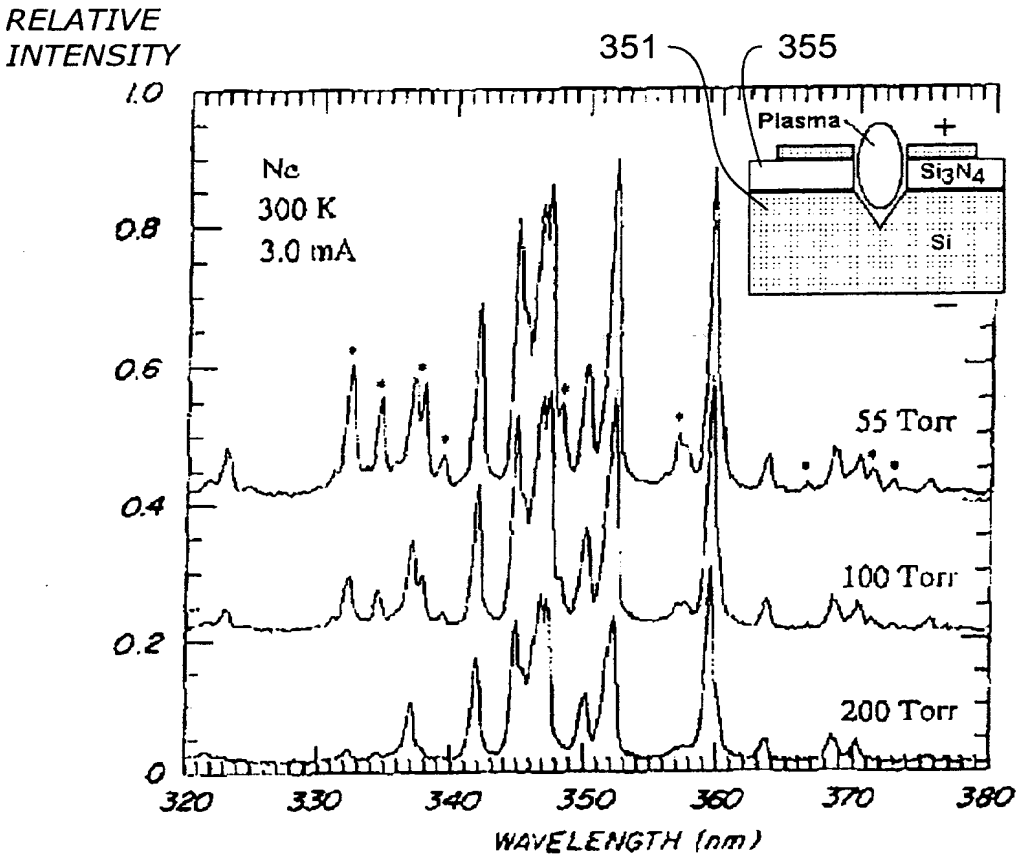
RELATIVE
INTENSITY
351
355
1.0
0.8
0.6
0.4
0.2
0
Ne
300 K
3.0 mA
Plasma
+
Si_3N_4
Si
−
55 Torr
100 Torr
200 Torr
320
330
340
350
360
370
380
WAVELENGTH (nm)

Figure 12

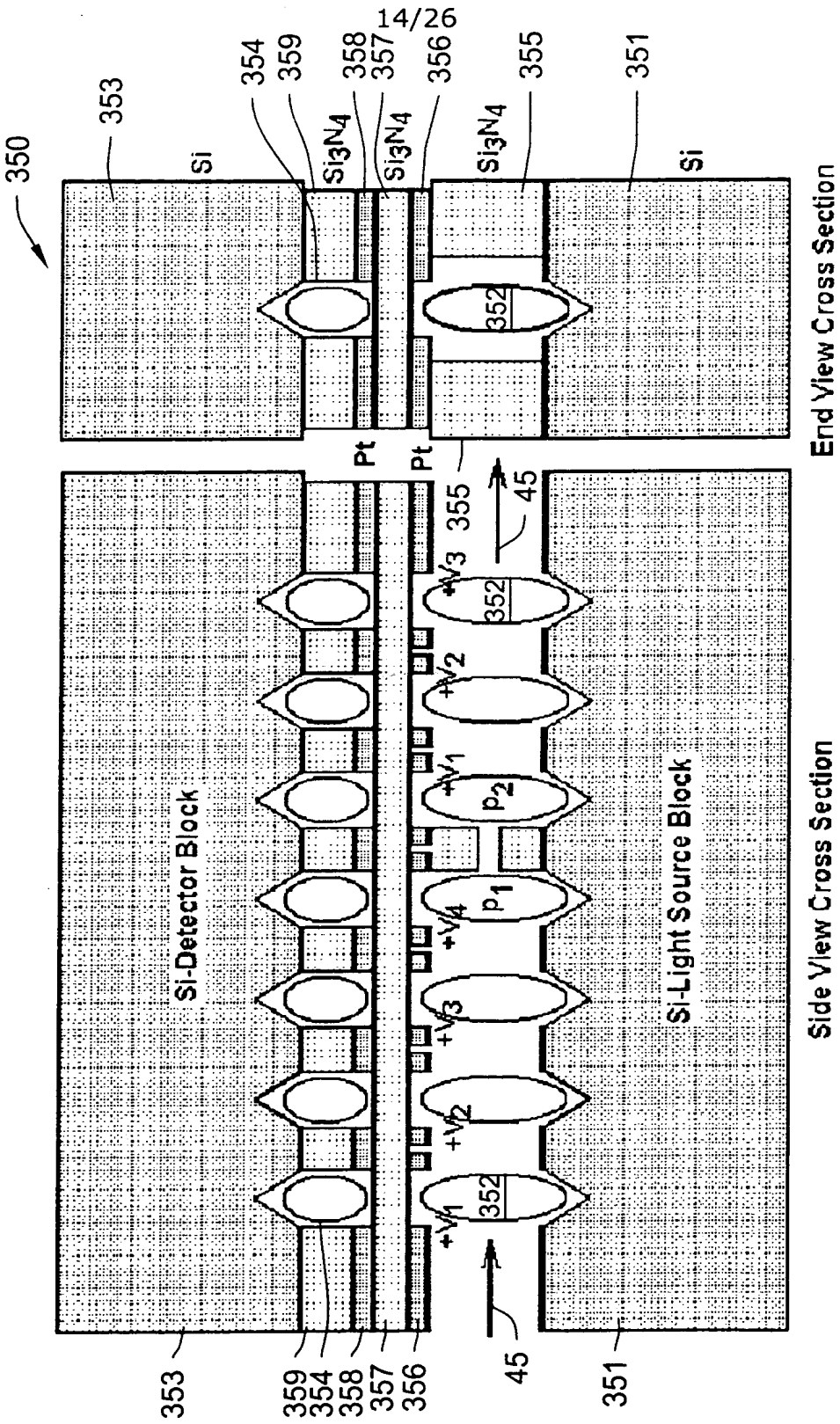

Figure 13

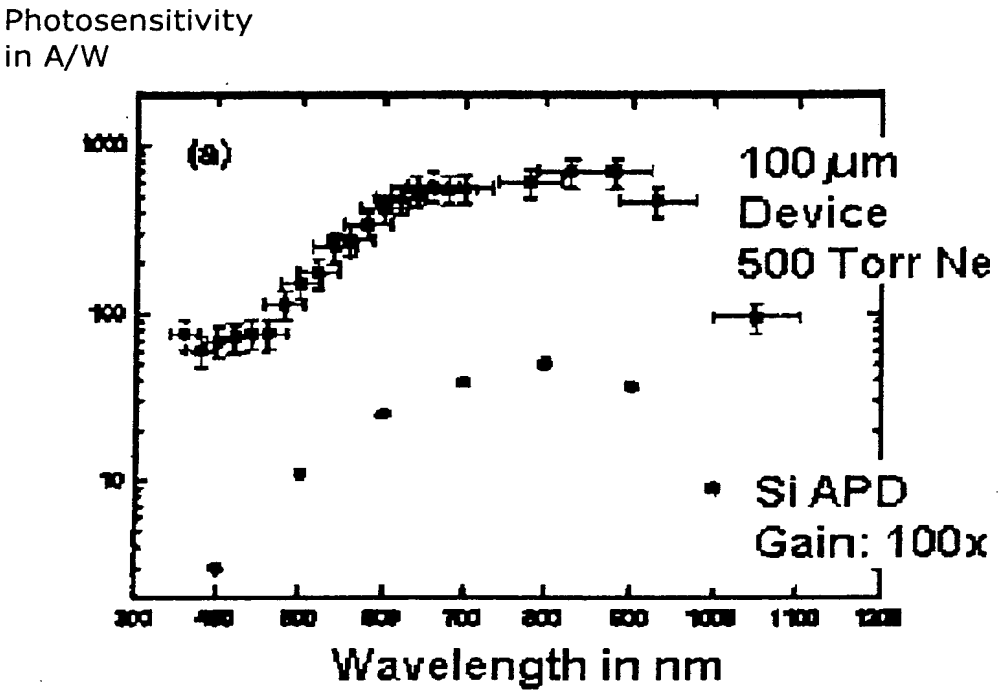
Photosensitivity
in A/W
(a)
100 µm
Device
500 Torr Ne
Si APD
Gain: 100x
Wavelength in nm

Figure 14

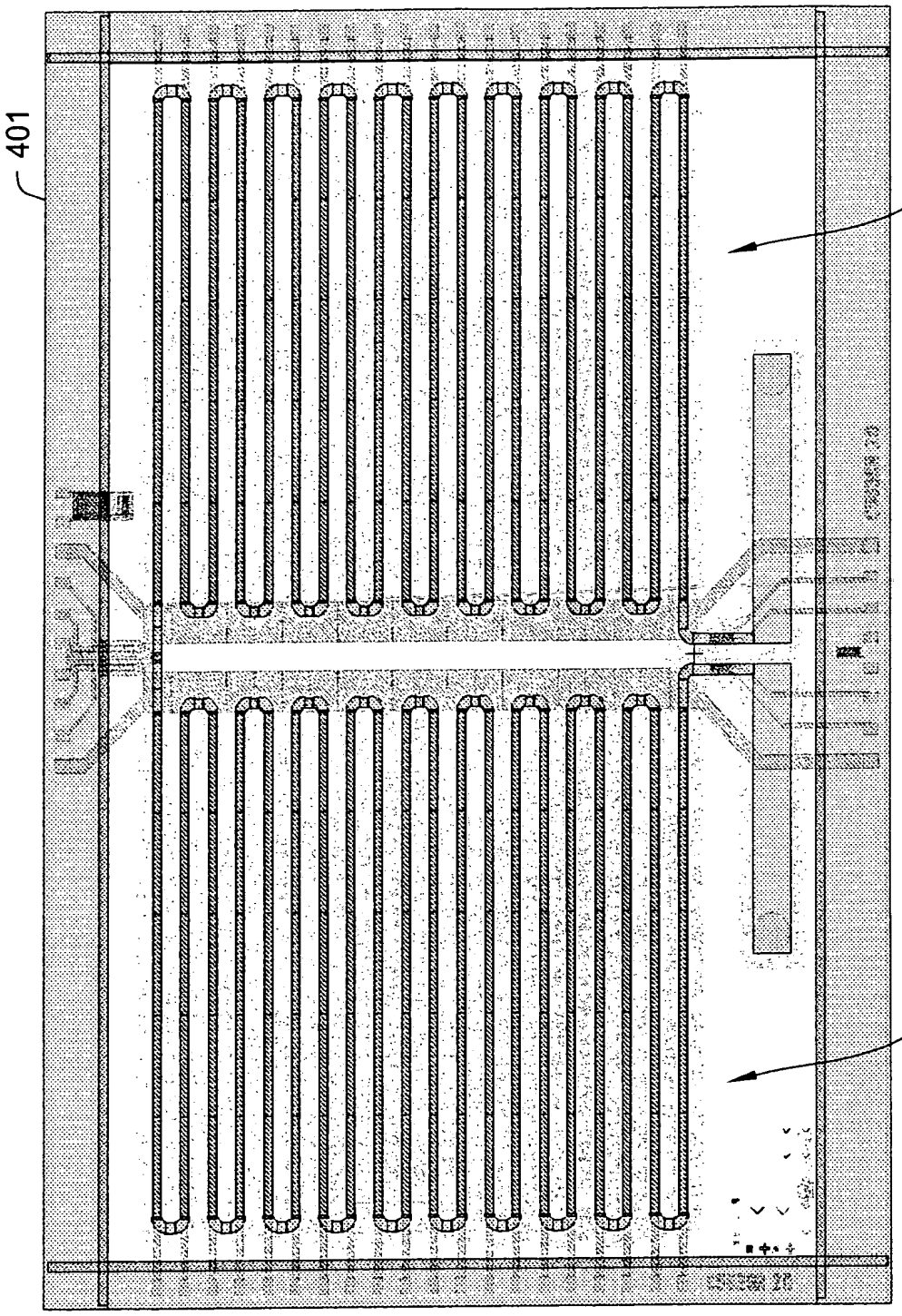

Figure 15

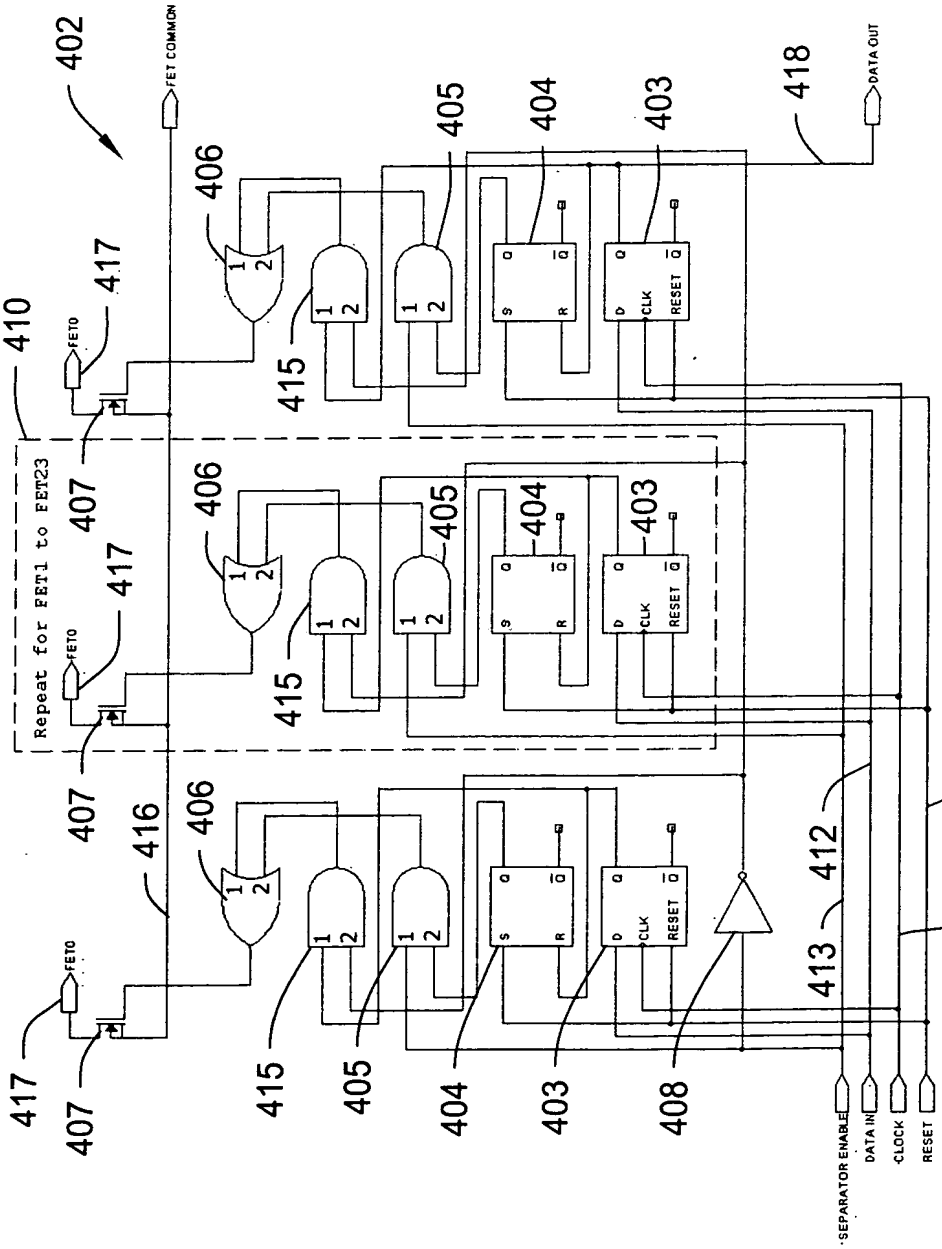
402
FET COMMON
DATA OUT
418
405
404
403
406
417
410
FET0
415
407
Repeat for FET1 to FET23
416
412
414
411
413
408
SEPARATOR ENABLE
DATA IN
CLOCK
RESET
CLK
RESET
D
S
R
Q

Figure 16

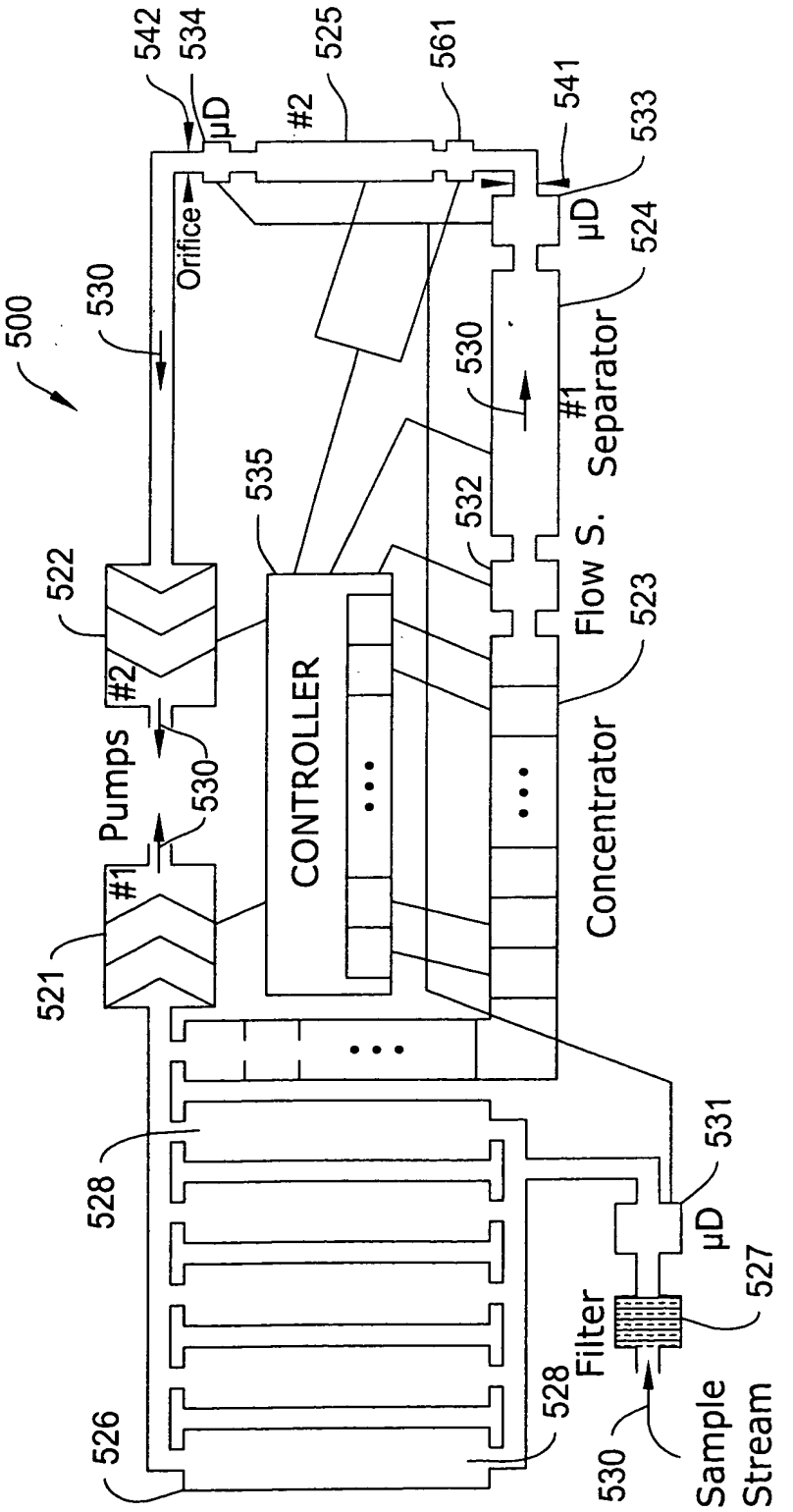
500
542
534
μD
#2
525
561
541
533
μD
524
Orifice
530
#1 Separator
Flow S.
523
Concentrator
532
535
CONTROLLER
522
#2
Pumps
#1
530
521
528
531
μD
527
Filter
528
526
530
Sample Stream

Figure 17

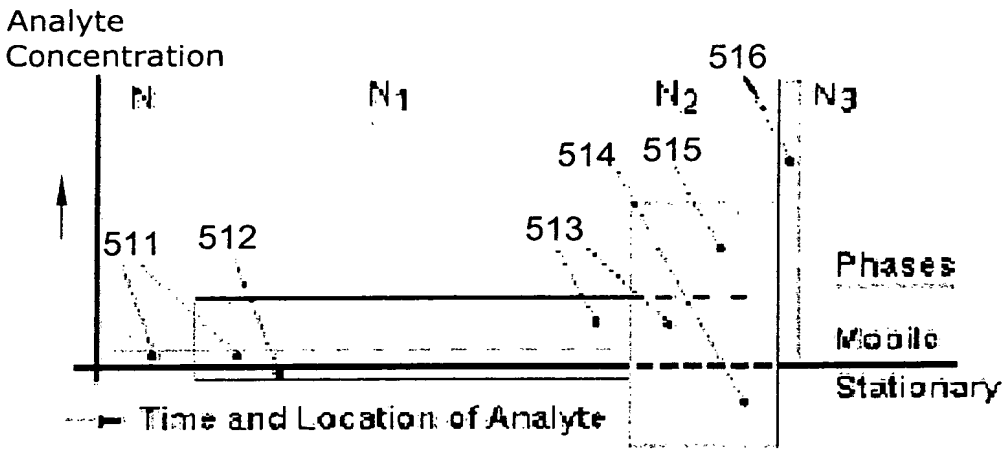

Figure 18

Analyte Masses = Film Length x Concentration

	N ppt	N_1 ppt	N_2 ppt	N_3 ppt
A	∞x1	500x100	5x10,000	1x 50,000
B	∞x1	1000x100	10x10,000	1x100,000
C	∞x1	5,000x100	50x10,000	1x500,000
D	∞x1	10,000x100	100x10,000	1x520,000 less
E	∞x1	100,000x100	1,000x10,000	10x1,000,000 (10^7)

Figure 19

Pres. Drop at 100 cm/s, 100x100 μm

No. of Elem. N1 -	Length L cm	Pres. Drop △p psi	Peak P. Q watts
50	0.5	2.629	20.5
505	0.1	5.311	41.3
1010	0.1	10.621	82.6

Figure 20

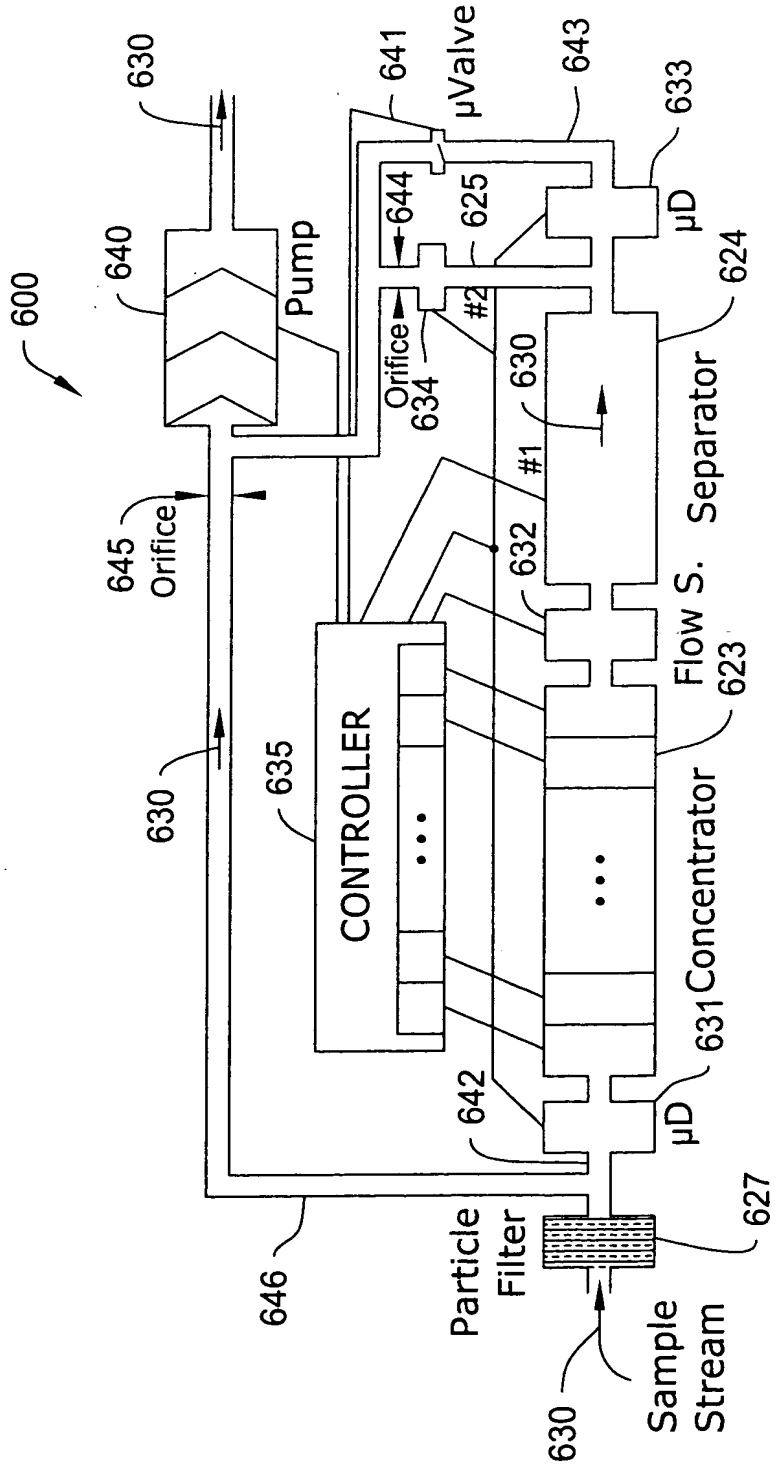
600
630
640
Pump
641
µValve
643
633
µD
644
625
624
Separator
Flow S.
623
Concentrator
631
µD
642
627
Particle Filter
646
630
Sample Stream
630
634
Orifice
#2
630
#1
632
645
Orifice
630
635
CONTROLLER

Figure 21

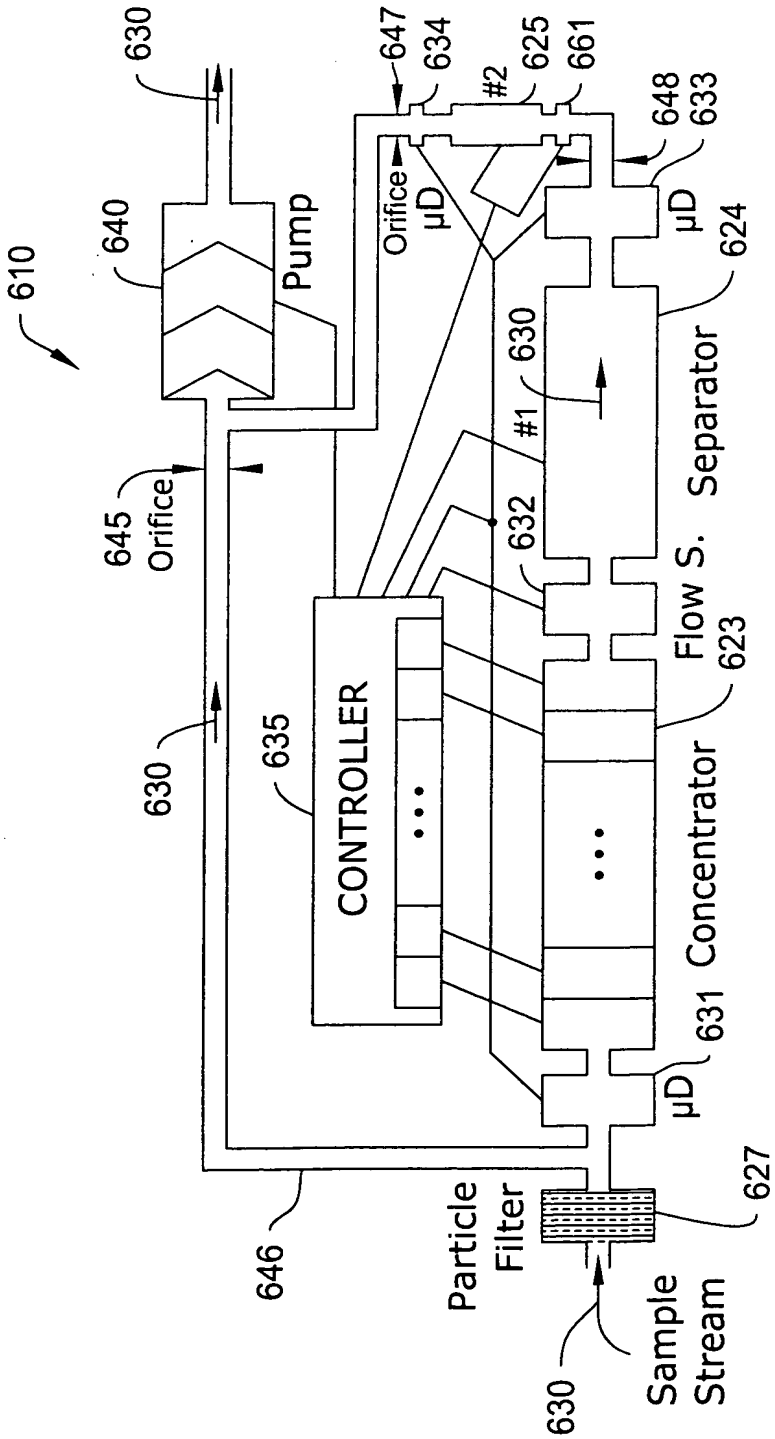
610
630
640
Pump
647
634
#2
625
661
648
633
Orifice
µD
µD
624
Separator
630
#1
645
Orifice
632
Flow S.
623
630
635
CONTROLLER
Concentrator
631
µD
627
646
Particle
Filter
630
Sample
Stream

Figure 22

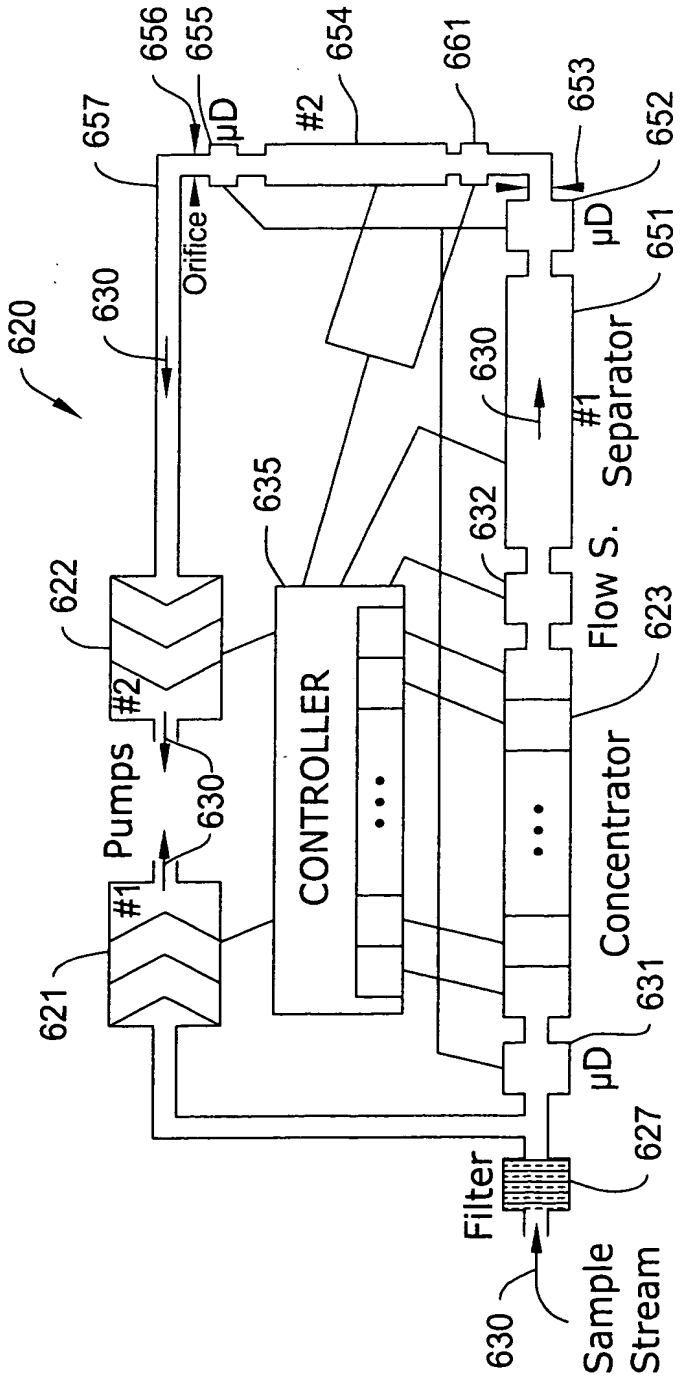
620
621
622
623
627
630
631
632
635
651
652
653
654
655
656
657
661
#1 Pumps
#2
CONTROLLER
Orifice
μD
#1 Separator
Flow S.
Concentrator
Filter
Sample Stream

Figure 23

Table: Design of µGc-µGC System on the Basis of a PHASED Structure

	v in cm/s	ID in cm	L in cm	s in µm	ℓ in mm	V in cm3/min	△p in psi
µGC-1	50	0.014	25	1	5	0.588	.671
µGC-2	250	0.007	10	0.15	2.5	0.588	5.365

	v	to	Half-Width △t	k=6 tR	k=0.2 v(optimal)	k=2 v(optimal)	k=2 R	k=0.2 △R(v-vo)
	cm/s	ms	ms	sec	cm/s	cm/s	-	%
µGC-1	50	500	20	3.00	68.8	56	8.76	2.5
µGC-2	250	40	2	0.24	149.2	118	8.00	6.2

Figure 24

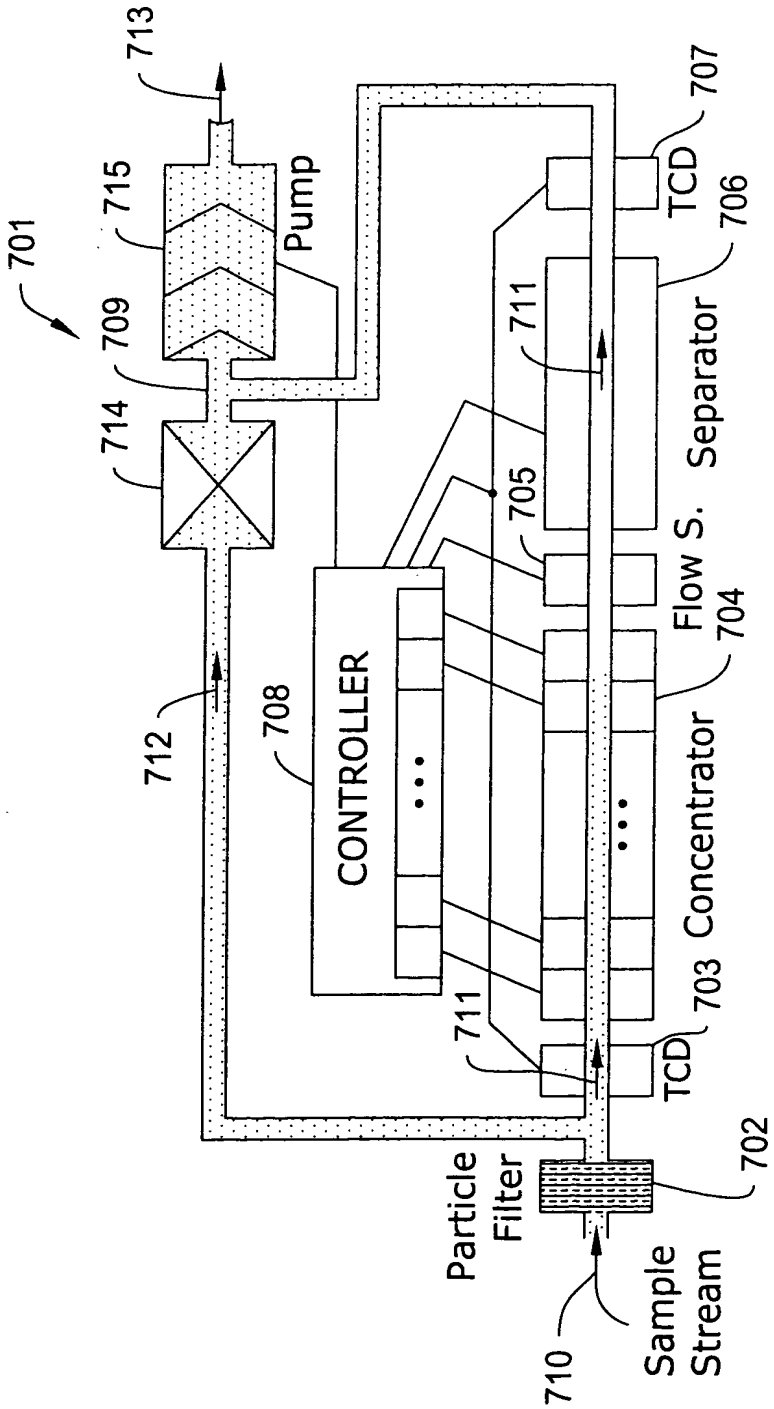
701
713
715
Pump
709
714
712
708
CONTROLLER
705
711
707
TCD
706
Separator
Flow S.
704
Concentrator
703
TCD
711
702
Particle
Filter
710
Sample
Stream

Figure 25

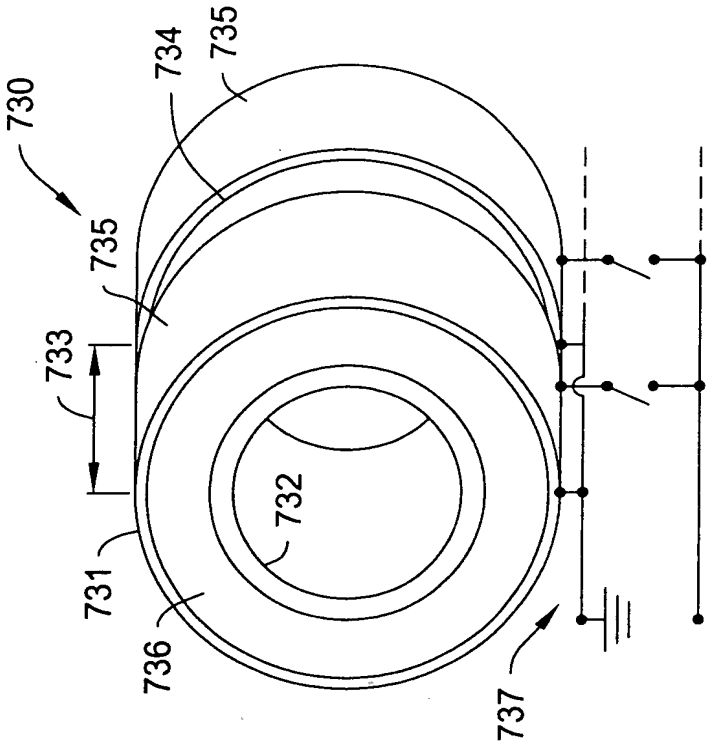

Figure 26B

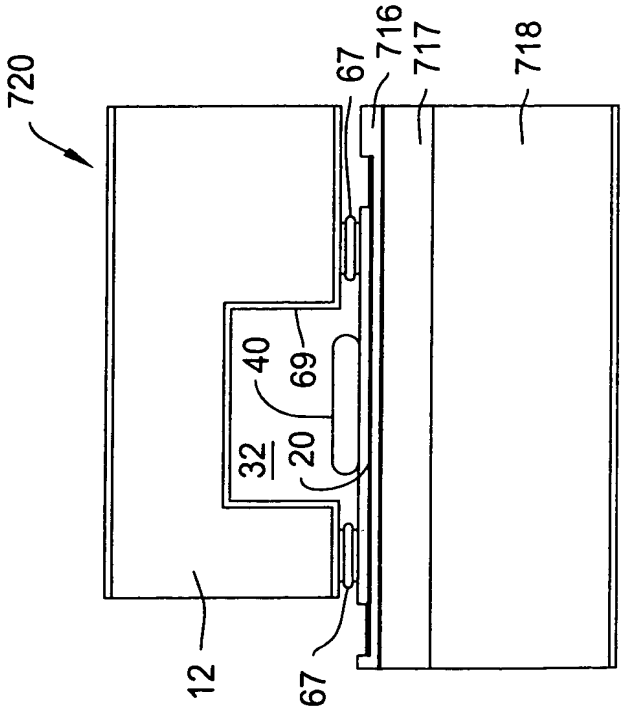

Figure 26A